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Title: Optimization of Space Systems Design

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The following areas have been investigated and papers on these topics have been submitted for publication and some have been accepted.

1. A Dynamic Programming Approach to Optimal Construction Staging.

The use of dynamic programming to optimize the staging of urban highway improvements is presented. The technique of dynamic programming transforms an N-dimensional problem into N 1-dimensional problems. Dynamic programming thus provides a tool to optimize a complex staging problem.

The technique of dynamic programming is demonstrated through the use of an example urban freeway network. The optimal sequence of staging decisions for two decision sets are determined.

This work was presented at the ASCE National Meeting on Transportation Engineering in San Diego, California, February 19, 1968 and will also appear in the Journal of the Highway Division, ASCE, 1968.

2. Optimal Blending and Production

Linear programming is used to treat the combined blending and production problem. The production problem is set up in such a way that it includes nearly all the operations such as distillation, extraction, and even reaction

in a processing industry. Since these operations are usually nonlinear it is necessary to linearize them for linear programming. This is done by choosing a set of typical operating points. The solution can be made arbitrarily close to the optimum by repeatedly solving the problem with different sets of typical operating points. A simple example is used to illustrate the approach and the technique is compared with other linearization techniques.

This paper has been accepted for publication in Control Engineering, 1968.

3. Optimal One-Dimensional Non-Linear Resource Allocation.

One-dimensional nonlinear resource allocation problems have been solved by the iterative use of a recurrence relation of the optimal state and decision for the system. Specifically two problems, the allocation of production effort to different facilities and a system reliability subject to a single nonlinear constraint, have been considered. The solution of the first problem is obtained analytically; however, the solution of the second one is obtained numerically. The second problem illustrates a way of solving numerically a two-points boundary value problem which frequently occurs when the present method is used.

This paper has been submitted to Management Science, 1968.

4. A Note on An Iterative Approach to Multicopy Traffic Assignment.

This paper is an extension of an earlier paper on traffic assignment that will appear in Transportation Research. It was submitted to Transportation Research, 1968.

5. Optimal Cotton Blending and Yarn Production

The purpose of this paper is to develop a linear programming model of the combined cotton blending and yarn production problem. The mill settings affect the ends down and breaking strength according to non-linear relationships. It is illustrated how these nonlinear relationships are approximated and incorporated into a linear programming model.

This paper was submitted to Textile Research Journal, 1968.

Submitted by:

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